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(54) Abstract Title: **Tubular expander**

(57) An apparatus for radially expanding and plastically deforming a tubular member 10, comprising: a tubular support member defining a longitudinal passage; a tubular outer sleeve coupled to the tubular support member defining a longitudinal passage and a plurality of radial bypass ports; an hydraulic slip 112 coupled to the tubular outer sleeve for controllably engaging the tubular member; one or more packer cups 134 coupled to the tubular outer sleeve for sealingly engaging the tubular member 10; a tubular inner sleeve 116 positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage, an annular longitudinal bypass passage, and one or more radial bypass passages; and a tubular expansion cone 122 having a throat passage for receiving a ball, an L-shaped bypass port, and a radial pressure port including an tapered outer expansion surface 122d for radially expanding and plastically deforming the tubular member 10.

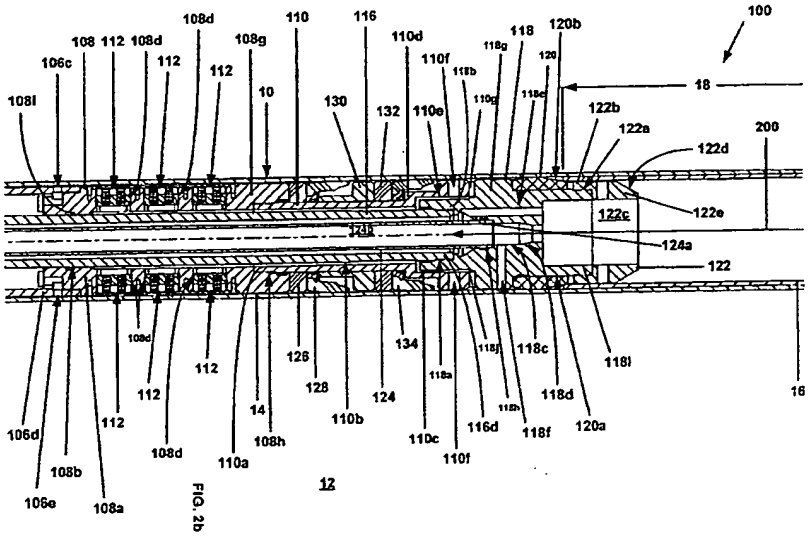

FIG. 2b

GB 2 418 941 A

GB 2418941 A continuation

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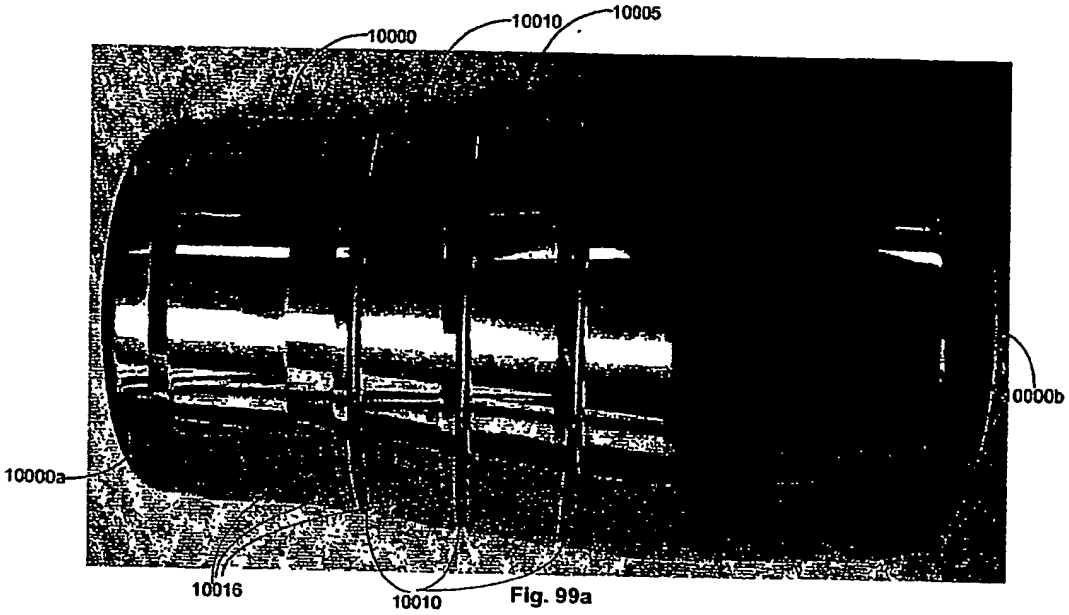

Fig. 99a

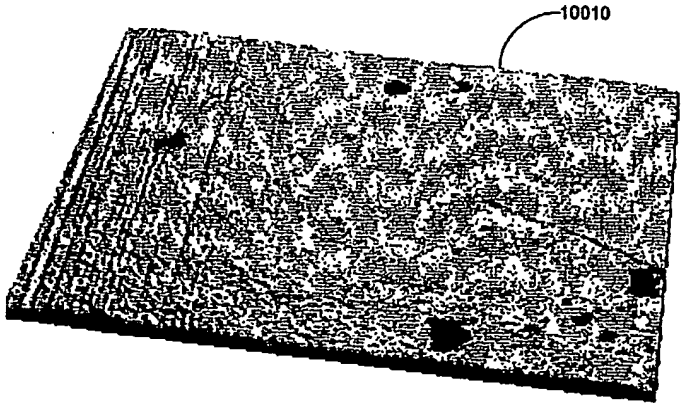

Fig. 99b

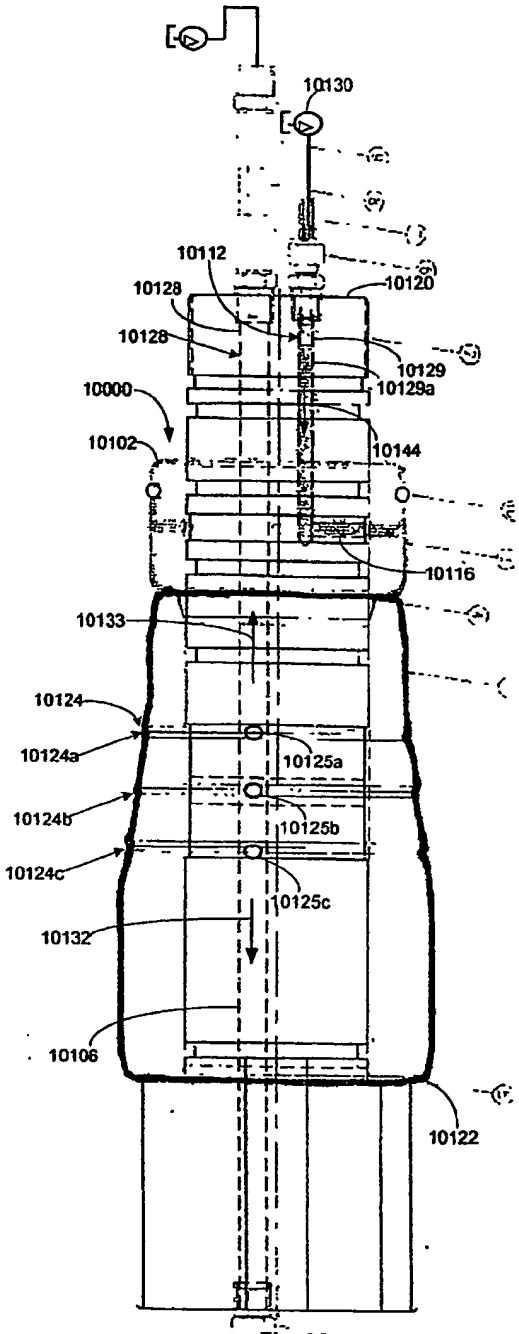
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Fig. 99c

expanded and plastically deformed portions of the second wellbore casing. In an exemplary embodiment, the radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings includes positioning a telescoping radial expansion device comprising an outer sleeve and an inner sleeve positioned within and movably coupled to the outer sleeve comprising a tubular expansion cone proximate the end of the second wellbore casing, and injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage the first wellbore casing and cause the inner sleeve to extend out of the outer sleeve into the overlapping portions of the first and second wellbore casings to cause the tubular expansion cone to radially expand and plastically deform the overlapping portions of the first and second wellbore casings. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone. In an exemplary embodiment, radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing includes reducing the operating pressure within the telescoping radial expansion device, moving the outer sleeve onto the inner sleeve of the telescoping radial expansion device, and injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage at least one of the first and second wellbore casings and cause the inner sleeve to extend out of the outer sleeve into the second wellbore casing to cause the tubular expansion cone to radially expand and plastically deform at least a portion of the second wellbore casing. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone.

An apparatus for forming a mono diameter wellbore casing has been described that includes means for positioning a first wellbore casing within the borehole, means for radially expanding and plastically deforming the first wellbore casing within the borehole, means for positioning a second wellbore casing within the borehole in overlapping relation to the first wellbore casing, means for radially expanding and plastically deforming the second wellbore casing within the borehole, means for radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings, and means for radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore

casing. The inside diameter of the portion of the first wellbore casing that does not overlap with the second wellbore casing is substantially equal to the inside diameter of the radially expanded and plastically deformed portions of the second wellbore casing. In an exemplary embodiment, the means for radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings includes means for positioning a telescoping radial expansion device comprising an outer sleeve and an inner sleeve positioned within and movably coupled to the outer sleeve comprising a tubular expansion cone proximate the end of the second wellbore casing, and means for injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage the first wellbore casing and cause the inner sleeve to extend out of the outer sleeve into the overlapping portions of the first and second wellbore casings to cause the tubular expansion cone to radially expand and plastically deform the overlapping portions of the first and second wellbore casings. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone. In an exemplary embodiment, the means for radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing includes means for reducing the operating pressure within the telescoping radial expansion device, means for moving the outer sleeve onto the inner sleeve of the telescoping radial expansion device, and means for injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage at least one of the first and second wellbore casings and cause the inner sleeve to extend out of the outer sleeve into the second wellbore casing to cause the tubular expansion cone to radially expand and plastically deform at least a portion of the second wellbore casing. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone.

An apparatus for radially expanding and plastically deforming a tubular member has been described that includes a tubular adapter defining a longitudinal passage, a tubular outer sleeve coupled to the tubular adapter defining a longitudinal passage, a tubular hydraulic slip body coupled to the tubular outer sleeve defining a plurality of L-shaped bypass ports and a plurality of radial hydraulic slip mounting passages, a plurality of hydraulic slips movably coupled and positioned within corresponding radial

hydraulic slip mounting passages for engaging the tubular member, a tubular packer cup mandrel coupled to the tubular hydraulic slip body defining a longitudinal passage, a plurality of packer cups coupled to the tubular packer cup mandrel for sealingly engaging the tubular member, a tubular shoe positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage, a tubular inner mandrel positioned within and movably coupled to the tubular hydraulic slip body coupled to the tubular shoe defining a longitudinal passage and a plurality of radial bypass ports, a tubular expansion cone mandrel coupled to the tubular inner mandrel defining a longitudinal passage having a throat passage for receiving a ball, an L-shaped bypass port, and a radial pressure port, a tubular expansion cone coupled to the tubular expansion cone including a tapered outer expansion surface for radially expanding and plastically deforming the tubular member, a tubular guide nose coupled to the tubular expansion cone mandrel defining a longitudinal passage, a bypass tube positioned within the tubular inner mandrel coupled to the expansion cone mandrel and the tubular shoe defining a longitudinal passage, and an annular longitudinal bypass passage defined between the tubular inner mandrel and the bypass tube. In an exemplary embodiment, the longitudinal passages of the tubular adapter, bypass tube, and tubular expansion cone mandrel are fluidicly coupled. In an exemplary embodiment, the longitudinal passage of the tubular expansion cone mandrel is fluidicly coupled to the radial pressure port of the tubular expansion cone mandrel. In an exemplary embodiment, the L-shaped bypass port of the tubular expansion cone mandrel is fluidicly coupled to the annular longitudinal bypass passage, the radial bypass passages of the tubular inner mandrel, the L-shaped bypass ports of the tubular hydraulic slip body, and the radial bypass ports of the tubular outer sleeve.

An apparatus for radially expanding and plastically deforming a tubular member has been described that includes a tubular support member defining a longitudinal passage, a tubular outer sleeve coupled to the tubular support member defining a longitudinal passage and a plurality of radial bypass ports, an hydraulic slip coupled to the tubular outer sleeve for controllably engaging the tubular member, one or more packer cups coupled to the tubular outer sleeve for sealingly engaging the tubular member, a tubular inner sleeve positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage, an annular longitudinal bypass passage, and one or more radial bypass passages, and a tubular expansion cone coupled to the tubular inner sleeve defining a longitudinal passage having a throat passage for

receiving a ball, an L-shaped bypass port, and a radial pressure port including an tapered outer expansion surface for radially expanding and plastically deforming the tubular member. In an exemplary embodiment, the longitudinal passages of the tubular outer sleeve and the tubular expansion cone are fluidicly coupled. In an exemplary embodiment, the longitudinal passage of the tubular expansion cone is fluidicly coupled to the radial pressure port of the tubular expansion cone. In an exemplary embodiment, the L-shaped bypass port of the tubular expansion cone is fluidicly coupled to the annular longitudinal bypass passage and the radial bypass passages of the tubular inner sleeve, and the L-shaped bypass ports and the radial bypass ports of the tubular outer sleeve.

A method of radially expanding and plastically deforming a wellbore casing positioned within a borehole that traverses a subterranean formation has been described that includes positioning an outer tubular sleeve and an inner tubular sleeve comprising an expansion cone within the borehole, wherein the inner tubular sleeve is movably coupled to and at least partially housed within the outer tubular sleeve, injecting a fluidic material into the inner and outer tubular sleeves, coupling the outer tubular sleeve to the wellbore casing, and extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform a portion of the wellbore casing using the expansion cone. In an exemplary embodiment, injecting a fluidic material into the inner and outer tubular sleeves includes injecting the fluidic material into an annular chamber above the expansion cone. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone. In an exemplary embodiment, conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone includes conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone. In an exemplary embodiment, the method further includes depressuring the inner and outer tubular sleeves, decoupling the outer tubular sleeve and the wellbore casing, and collapsing the outer tubular sleeve onto the inner tubular sleeve. In an exemplary embodiment, the method further includes injecting a fluidic material into the inner and outer tubular sleeves, coupling the outer tubular sleeve to the wellbore casing, and extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially

expand and plastically deform another portion of the wellbore casing. In an exemplary embodiment, injecting a fluidic material into the inner and outer tubular sleeves includes injecting the fluidic material into an annular chamber above the expansion cone. In an exemplary embodiment, the method further includes conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone. In an exemplary embodiment, conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone includes conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

An apparatus for radially expanding and plastically deforming a wellbore casing positioned within a borehole that traverses a subterranean formation has been described that includes means for positioning an outer tubular sleeve and an inner tubular sleeve comprising an expansion cone within the borehole, wherein the inner tubular sleeve is movably coupled to and at least partially housed within the outer tubular sleeve, means for injecting a fluidic material into the inner and outer tubular sleeves, means for coupling the outer tubular sleeve to the wellbore casing, and means for extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform a portion of the wellbore casing using the expansion cone. In an exemplary embodiment, the means for injecting a fluidic material into the inner and outer tubular sleeves includes means for injecting the fluidic material into an annular chamber above the expansion cone. In an exemplary embodiment, the apparatus further includes means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone. In an exemplary embodiment, the means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone includes means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone. In an exemplary embodiment, the apparatus further includes means for depressuring the inner and outer tubular sleeves, means for decoupling the outer tubular sleeve and the wellbore casing, and means for collapsing the outer tubular sleeve onto the inner tubular sleeve. In an exemplary embodiment, the apparatus further includes means for injecting a fluidic material into the inner and outer tubular sleeves, means for coupling

the outer tubular sleeve to the wellbore casing, means for extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform another portion of the wellbore casing. In an exemplary embodiment, the means for injecting a fluidic material into the inner and outer tubular sleeves includes means for injecting the fluidic material into an annular chamber above the expansion cone. In an exemplary embodiment, the apparatus further includes means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone. In an exemplary embodiment, the means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone includes means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

It is understood that variations may be made in the foregoing without departing from the scope of the invention. For example, the teachings of the present illustrative embodiments may be used to provide a wellbore casing, a pipeline, or a structural support. Furthermore, the elements and teachings of the various illustrative embodiments may be combined in whole or in part in some or all of the illustrative embodiments.

Although illustrative embodiments of the invention have been shown and described, a wide range of modification, changes and substitution is contemplated in the foregoing disclosure. In some instances, some features of the present invention may be employed without a corresponding use of the other features. Accordingly, it is appropriate that the appended claims be construed broadly and in a manner consistent with the scope of the invention.

CLAIMS

1. An apparatus for radially expanding and plastically deforming a tubular member, comprising:

a tubular support member defining a longitudinal passage;

a tubular outer sleeve coupled to the tubular support member defining a longitudinal passage;

one or more hydraulic slips coupled to the tubular outer sleeve for controllably engaging the tubular member;

one or more packer cups coupled to the tubular outer sleeve for sealingly engaging the tubular member;

a tubular inner sleeve positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage and one or more radial bypass passages; and

an expansion device coupled to the tubular inner sleeve including one or more tapered outer expansion surfaces for radially expanding and plastically deforming the tubular member.

2. The apparatus of claim 1, wherein the expansion device comprises a tubular expansion device defining a longitudinal passage; and

wherein the longitudinal passages of the tubular outer sleeve and the tubular expansion device are fluidicly coupled.

3. The apparatus of claim 1, wherein the expansion device comprises a tubular expansion device defining a longitudinal passage having a throat passage for receiving a ball, a bypass port, and a radial pressure port; and

wherein the longitudinal passage of the tubular expansion device is fluidicly coupled to the radial pressure port of the tubular expansion device.

4. The apparatus of claim 1, wherein the expansion device comprises a tubular expansion device defining a longitudinal passage having a throat passage for receiving a ball, a bypass port, and a radial pressure port;

wherein the tubular inner sleeve defines an annular longitudinal bypass passage;

wherein the tubular outer sleeve defines a plurality of radial bypass ports; and

wherein the bypass port of the tubular expansion device is fluidicly coupled to the annular longitudinal bypass passage and the one or more radial bypass passages of the tubular inner sleeve, and the radial bypass ports of the tubular outer sleeve.

5. The apparatus of claim 1, further comprising:

a tubular hydraulic slip body coupled to the tubular outer sleeve defining one or more radial hydraulic slip mounting passages;

wherein the one or more hydraulic slips are movably coupled and positioned within corresponding radial hydraulic slip mounting passages for controllably engaging the tubular member; and

wherein the apparatus further comprises:

a tubular packer cup mandrel coupled to the tubular hydraulic slip body defining a longitudinal passage; and

an expansion device mandrel coupled to the tubular inner sleeve defining a longitudinal passage, a bypass port, and a radial pressure port;

wherein the one or more packer cups are coupled to the tubular packer cup mandrel; and

wherein the expansion device is coupled to the expansion device mandrel.

What is claimed is:

1. A method of forming a mono diameter wellbore casing within a borehole that traverses a subterranean formation, comprising:

positioning a first wellbore casing within the borehole;

radially expanding and plastically deforming the first wellbore casing within the borehole;

positioning a second wellbore casing within the borehole in overlapping relation to the first wellbore casing;

radially expanding and plastically deforming the second wellbore casing within the borehole;

radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings; and

radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing;

wherein the inside diameter of the portion of the first wellbore casing that does not overlap with the second wellbore casing is substantially equal to the inside diameter of the radially expanded and plastically deformed portions of the second wellbore casing.

2. The method of claim 1, wherein radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings comprises:

positioning a telescoping radial expansion device comprising an outer sleeve and an inner sleeve positioned within and movably coupled to the outer sleeve comprising a tubular expansion cone proximate the end of the second wellbore casing; and

injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage the first wellbore casing and cause the inner sleeve to extend out of the outer sleeve into the overlapping portions of the first and second wellbore casings to cause the tubular expansion cone to radially expand and plastically deform the overlapping portions of the first and second wellbore casings.

3. The method of claim 2, further comprising:

conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the

tubular expansion cone.

4. The method of claim 2, wherein radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing comprises:

reducing the operating pressure within the telescoping radial expansion device;

moving the outer sleeve onto the inner sleeve of the telescoping radial expansion device; and

injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage at least one of the first and second wellbore casings and cause the inner sleeve to extend out of the outer sleeve into the second wellbore casing to cause the tubular expansion cone to radially expand and plastically deform at least a portion of the second wellbore casing.

5. The method of claim 4, further comprising:

conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone.

6. An apparatus for forming a mono diameter wellbore casing, comprising:

means for positioning a first wellbore casing within the borehole;

means for radially expanding and plastically deforming the first wellbore casing within the borehole;

means for positioning a second wellbore casing within the borehole in overlapping relation to the first wellbore casing;

means for radially expanding and plastically deforming the second wellbore casing within the borehole;

means for radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings; and

means for radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing;

wherein the inside diameter of the portion of the first wellbore casing that does not overlap with the second wellbore casing is substantially equal to the inside diameter of the radially expanded and plastically deformed portions of the second wellbore casing.

7. The apparatus of claim 6, wherein means for radially expanding and plastically deforming the overlapping portions of the first and second wellbore casings comprises:

means for positioning a telescoping radial expansion device comprising an outer sleeve and an inner sleeve positioned within and movably coupled to the outer sleeve comprising a tubular expansion cone proximate the end of the second wellbore casing; and

means for injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage the first wellbore casing and cause the inner sleeve to extend out of the outer sleeve into the overlapping portions of the first and second wellbore casings to cause the tubular expansion cone to radially expand and plastically deform the overlapping portions of the first and second wellbore casings.

8. The method of claim 7, further comprising:

conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone.

9. The apparatus of claim 7, wherein means for radially expanding and plastically deforming at least a portion of the second wellbore casing that does not overlap with the first wellbore casing comprises:

means for reducing the operating pressure within the telescoping radial expansion device;

means for moving the outer sleeve onto the inner sleeve of the telescoping radial expansion device; and

means for injecting a fluidic material into the telescoping radial expansion device to cause the outer sleeve to engage at least one of the first and second wellbore casings and cause the inner sleeve to extend out of the outer sleeve into the second wellbore casing to cause the tubular expansion cone to radially expand and plastically deform at least a portion of the second wellbore casing.

10. The method of claim 9, further comprising:

conveying fluidic materials within the borehole that are displaced by the extension of the inner sleeve to a location within the borehole above the tubular expansion cone.

11. An apparatus for radially expanding and plastically deforming a tubular member,

comprising:

a tubular adapter defining a longitudinal passage;

a tubular outer sleeve coupled to the tubular adapter defining a longitudinal passage;

a tubular hydraulic slip body coupled to the tubular outer sleeve defining a plurality of L-shaped bypass ports and a plurality of radial hydraulic slip mounting passages;

a plurality of hydraulic slips movably coupled and positioned within corresponding radial hydraulic slip mounting passages for engaging the tubular member;

a tubular packer cup mandrel coupled to the tubular hydraulic slip body defining a longitudinal passage;

a plurality of packer cups coupled to the tubular packer cup mandrel for sealingly engaging the tubular member;

a tubular shoe positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage;

a tubular inner mandrel positioned within and movably coupled to the tubular hydraulic slip body coupled to the tubular shoe defining a longitudinal passage and a plurality of radial bypass ports;

a tubular expansion cone mandrel coupled to the tubular inner mandrel defining a longitudinal passage having a throat passage for receiving a ball, an L-shaped bypass port, and a radial pressure port;

a tubular expansion cone coupled to the tubular expansion cone including a tapered outer expansion surface for radially expanding and plastically deforming the tubular member;

a tubular guide nose coupled to the tubular expansion cone mandrel defining a longitudinal passage;

a bypass tube positioned within the tubular inner mandrel coupled to the expansion cone mandrel and the tubular shoe defining a longitudinal passage; and

an annular longitudinal bypass passage defined between the tubular inner mandrel and the bypass tube.

12. The apparatus of claim 11, wherein the longitudinal passages of the tubular adapter, bypass tube, and tubular expansion cone mandrel are fluidicly coupled.

13. The apparatus of claim 11, wherein the longitudinal passage of the tubular expansion cone mandrel is fluidicly coupled to the radial pressure port of the tubular expansion cone mandrel.

14. The apparatus of claim 11, wherein the L-shaped bypass port of the tubular expansion cone mandrel is fluidicly coupled to the annular longitudinal bypass passage, the radial bypass passages of the tubular inner mandrel, the L-shaped bypass ports of the tubular hydraulic slip body, and the radial bypass ports of the tubular outer sleeve.

15. An apparatus for radially expanding and plastically deforming a tubular member, comprising:

a tubular support member defining a longitudinal passage;

a tubular outer sleeve coupled to the tubular support member defining a longitudinal passage and a plurality of radial bypass ports;

an hydraulic slip coupled to the tubular outer sleeve for controllably engaging the tubular member;

one or more packer cups coupled to the tubular outer sleeve for sealingly engaging the tubular member;

a tubular inner sleeve positioned within and movably coupled to the tubular outer sleeve defining a longitudinal passage, an annular longitudinal bypass passage, and one or more radial bypass passages; and

a tubular expansion cone coupled to the tubular inner sleeve defining a longitudinal passage having a throat passage for receiving a ball, an L-shaped bypass port, and a radial pressure port including an tapered outer expansion surface for radially expanding and plastically deforming the tubular member.

16. The apparatus of claim 15, wherein the longitudinal passages of the tubular outer sleeve and the tubular expansion cone are fluidicly coupled.

17. The apparatus of claim 15, wherein the longitudinal passage of the tubular expansion cone is fluidicly coupled to the radial pressure port of the tubular expansion cone.

18. The apparatus of claim 15, wherein the L-shaped bypass port of the tubular expansion cone is fluidicly coupled to the annular longitudinal bypass passage and the radial bypass passages of the tubular inner sleeve, and the L-shaped bypass ports and the radial bypass ports of the tubular outer sleeve.

19. A method of radially expanding and plastically deforming a wellbore casing positioned within a borehole that traverses a subterranean formation, comprising:

positioning an outer tubular sleeve and an inner tubular sleeve comprising an expansion cone within the borehole, wherein the inner tubular sleeve is movably coupled to and at least partially housed within the outer tubular sleeve;

injecting a fluidic material into the inner and outer tubular sleeves;

coupling the outer tubular sleeve to the wellbore casing; and

extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform a portion of the wellbore casing using the expansion cone.

20. The method of claim 19, wherein injecting a fluidic material into the inner and outer tubular sleeves comprises:

injecting the fluidic material into an annular chamber above the expansion cone.

21. The method of claim 19, further comprising:

conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone.

22. The method of claim 21, wherein conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone comprises:

conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

23. The method of claim 19, further comprising:

depressuring the inner and outer tubular sleeves;

decoupling the outer tubular sleeve and the wellbore casing; and

collapsing the outer tubular sleeve onto the inner tubular sleeve.

24. The method of claim 23, further comprising:

injecting a fluidic material into the inner and outer tubular sleeves;

coupling the outer tubular sleeve to the wellbore casing;

extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform another portion of the wellbore casing.

25. The method of claim 24, wherein injecting a fluidic material into the inner and

outer tubular sleeves comprises:

injecting the fluidic material into an annular chamber above the expansion cone.

26. The method of claim 24, further comprising:

conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone.

27. The method of claim 26, wherein conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone comprises:

conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

28. An apparatus for radially expanding and plastically deforming a wellbore casing positioned within a borehole that traverses a subterranean formation, comprising:

means for positioning an outer tubular sleeve and an inner tubular sleeve comprising an expansion cone within the borehole, wherein the inner tubular sleeve is movably coupled to and at least partially housed within the outer tubular sleeve;

means for injecting a fluidic material into the inner and outer tubular sleeves;

means for coupling the outer tubular sleeve to the wellbore casing; and

means for extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform a portion of the wellbore casing using the expansion cone.

29. The apparatus of claim 28, wherein means for injecting a fluidic material into the inner and outer tubular sleeves comprises:

means for injecting the fluidic material into an annular chamber above the expansion cone.

30. The apparatus of claim 28, further comprising:

means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone.

31. The apparatus of claim 30, wherein means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone comprises:

means for conveying fluidic materials within the borehole displaced by the

extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

32. The apparatus of claim 28, further comprising:

means for depressuring the inner and outer tubular sleeves;

means for decoupling the outer tubular sleeve and the wellbore casing; and

means for collapsing the outer tubular sleeve onto the inner tubular sleeve.

33. The apparatus of claim 32, further comprising:

means for injecting a fluidic material into the inner and outer tubular sleeves;

means for coupling the outer tubular sleeve to the wellbore casing;

means for extending the inner tubular sleeve out of the outer tubular sleeve into the wellbore casing to radially expand and plastically deform another portion of the wellbore casing.

34. The apparatus of claim 33, wherein means for injecting a fluidic material into the inner and outer tubular sleeves comprises:

means for injecting the fluidic material into an annular chamber above the expansion cone.

35. The apparatus of claim 33, further comprising:

means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve to a location above the expansion cone.

36. The apparatus of claim 35, wherein means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve above the expansion cone comprises:

means for conveying fluidic materials within the borehole displaced by the extension of the inner tubular sleeve through an annular passage and one or more radial passages to the location above the expansion cone.

34

Application No:	GB0525774.6	**Examiner:**	Dr Michael Gooch
Claims searched:	1-5	**Date of search:**	2 February 2006

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	GB 2408278 A (EVENTURE)

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

E1F

Worldwide search of patent documents classified in the following areas of the IPC

E21B

The following online and other databases have been used in the preparation of this search report

Online: EPODOC, WPI

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